IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	Lee D. Saathoff et al.
Application No.:	10/788,732
Filing Date:	February 27, 2004
Confirmation No.:	6113
Title:	POWER TRANSMISSION FLUIDS
Examiner:	James C. Goloboy
Group Art Unit:	1797

DECLARATION OF LEE D. SAATHOFF

Mail Stop AF
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

I, Lee D. Saathoff, hereby declare as follows:

1. I am presently employed by Afton Chemical Corporation, Richmond, Virginia, as an Engineering Specialist. I have over 4 years of experience in the area of transmission lubricant research with Afton Chemical Corporation (formerly Ethyl Corporation). Prior to my employment with Afton Chemical in Driveline Lubricants, I have an additional 30 years at Afton Chemical Corporation.

2. I graduated from Southern Illinois University in Edwardsville, Illinois in 1989 with a Bachelor of Science degree in Electrical Engineering.

3. I am the author, or co-author, of 2 papers in reviewed Journals, relating to gear and transmission lubricants, and am an inventor on 2 U.S. Patents.

4. I am a named inventor of U.S. Application No. 10/788,732. I have read the specification and claims and am familiar with the application. I have also reviewed the Office Action mailed December 9, 2008 as well as the Office Action mailed September 24, 2007 which is referenced in the later mailed Office Action.

5. We have surprisingly found that a tertiary amine where R_1 comprises an alkyl or alkenyl group having about 1 to 4 carbon atoms and R_2 and R_3 independently comprise one of an alkyl, an alkenyl, an alkynyl, an alkylthioalkyl, a haloalkyl, and a haloalkenyl group having from about 8 to 30 carbon atoms provides

significant advantages over other tertiary amines when utilized in a power transmission fluid. For example, it has surprisingly been found that the presently claimed transmission fluids can be used to control friction properties for longer periods of time than transmission fluids containing other tertiary amines.

We conducted additional testing on two fluids which data is included and explained below.

Two transmission fluid formulations, differing only in that the inventive fluid contained a tertiary amine including one methyl group (R1 of 1 carbon and an R2 and R3 of 12-14 carbon atoms) and the comparative fluid contained a tertiary amine including two methyl groups (R1 and R2 of 1 carbon atom and an R3 of 18 carbon atoms), were tested in the LFW-1 friction test (explained in detail at page 15 of the present specification). The test sample formulations are disclosed in the table below:

Test samples	Inventive Composition, wt%	Comparative Composition, wt%
Tertiary Amine R1 = 1 C R2 = 12-14 C R3 = 12-14 C	1.0	
Tertiary Amine R1 = 1 C R2 = 1 C R3 = 18 C		1.0
Dispersant ~950 MW PIB based dispersant[1]	4.0	4.0
Base Oil Yubase 4[2]	85	85
Base Oil Synthetic ester[3]	1.0	1.0
Additive Process Oil Hydro-Treated 50 Neutral	1.73	1.73
Other Typical Transmission Fluid Additives	Balance	Balance

[1] ~950 molecular weight polyisobutylene based dispersant having no boron or phosphorus.
[2] Yubase 4 is a group II/III base stock with viscosity of about 4.2 cSt at 100 °C
[3] Diisodecyl adipate

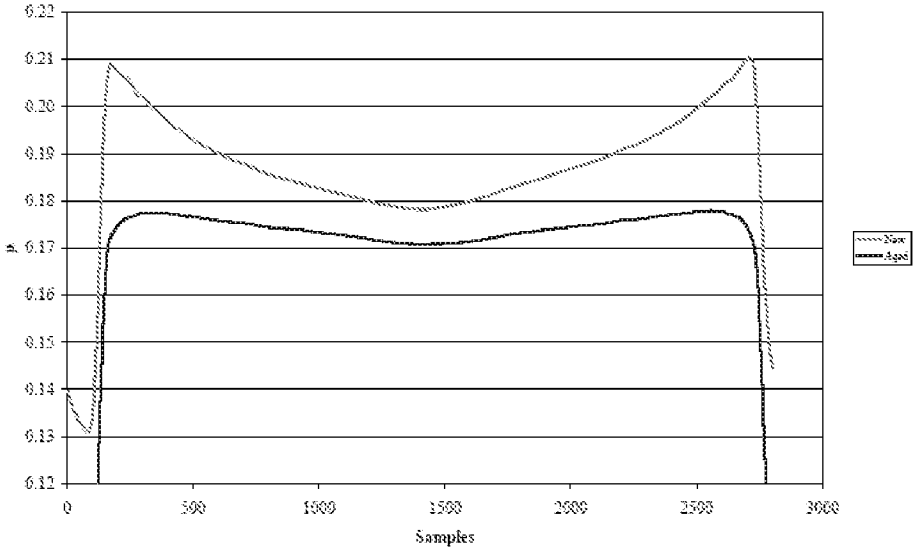
The formulations were each tested before aging and after aging, identified as "New" and "Aged", respectively, in the graphs inserted into the text below. Measurements of friction characteristics were taken at the start of the test when the ring was stationary (the left-hand side of the graph) and as the ring gradually accelerated to its maximum speed (about 0.5 m/s in the center of the graph) and as the ring gradually decelerated back to zero (the right-hand side of the graph).

In order to assess the difference between the tertiary amine including a single methyl group and the tertiary amine including two methyl groups, the ratio of static to dynamic friction was calculated for each

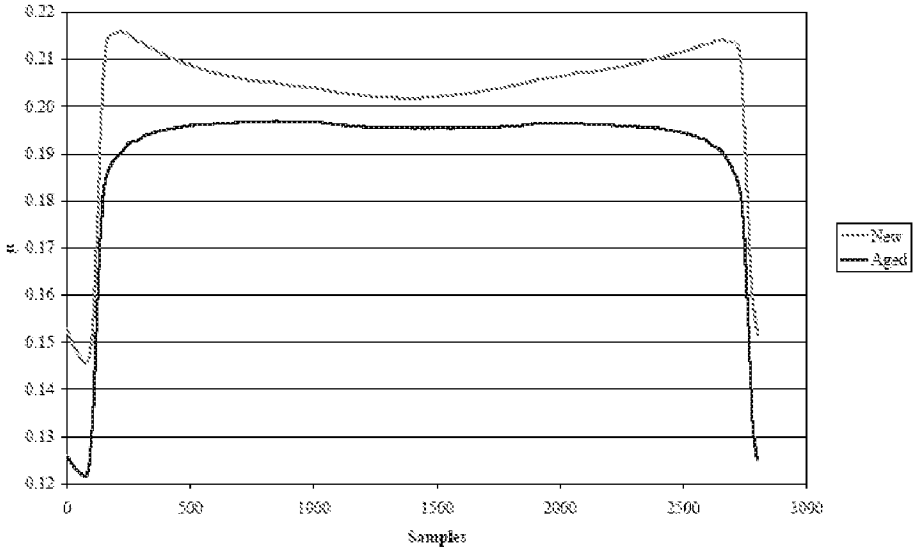
run. A difference of almost 10% was found between the "New" formulation containing one methyl group and the "New" formulation containing two methyl groups. A difference of almost 6% was found between the "Aged" formulations. Further, as is apparent from viewing the Figures, the difference in static to dynamic friction ratio of the inventive fluid is greater for new and aged when compared to the difference in static to dynamic friction ratio for new and aged of the comparative fluid. (i.e., in the inventive fluid figure, this effect is shown, for example, by a greater difference in static friction between the new and aged fluid when compared to the small difference in static friction between the new and aged fluid of the comparative fluid. Further, the dynamic friction of the inventive fluid changes from a dip to a plateau as the fluid ages. This is desirable. In the comparative fluid, the change is much less pronounced. The new and aged fluids are very similar in performance, which indicates little change). Such change between new and aged fluid performance demonstrates the benefits of the presently claimed invention. As a power transmission fluid ages, friction modifiers degrade and/or deteriorate, losing their ability to provide friction control. Typically, once the friction modifiers in a transmission fluid lose the ability to provide satisfactory friction control, it must be replaced. However, it has been found that by including tertiary amines in transmission fluids in sufficient amounts and of the type presently claimed, the transmission fluid continues to effectively control friction properties longer than other transmission fluids. The present data demonstrates this since as the inventive fluid ages, the static to dynamic friction ratio shows a more significant decrease than the comparative formulation. The tertiary amines according to the presently claimed invention, do not significantly affect friction initially, but become increasingly effective as the fluid ages and the friction modifiers degrade and/or deteriorate.

Accordingly, we respectfully submit that there is a difference between the tertiary amines, and the selection of a tertiary amine as defined in the present claims does bring about an unexpected technical effect.

New & Aged Tertiary Amine with 1 Methyl Group in LFW-1



New & Aged Tertiary Amine with 2 Methyl Groups in LFW-1



9. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

August 7, 2009
Date

Lee D. Saathoff
Lee D. Saathoff